Large Capacity, High Speed Centrifuge

1096R

User's Manual

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GYROZEN

Designed to suit your exact needs

Wide range of modern centrifuges for a wide variety of laboratory applications

THE BEST FUNCTIONAL QUALITY

- Manufactured and tested to IEC standards, stable spinning operation within +/-2% variation
- Steady and soft deceleration with dynamic brake technology
- Unique internal air flow design that protects heating of samples
- High capacity, strong compressor ensures fast cooling of chamber and samples
- Fast cool function 4℃ in 5 minutes for fast start up and fast cool down of sample
- Automatic rotor identification functions
- Automatic RPM/RCF conversion

SAFETY and ROBUSTNESS

- Triple laminated ABS/Steel door construction minimizes noise and heat transmissions
- Safety door lock mechanism ensures the door is locked whilst in operation mode
- Unique door-drop protection protects the operator and samples when loading and unloading
- Automatic rotor identification secures operational safety
- Automatic detection and alarms for imbalance, excess speed and heating
- Automatic door-open scheme with safety level of aperture depth not to damage operators
- Emergency door-lock release helps to open the instrument when power blackout or sudden stoppage occurs
- The compressor-off function during door-open minimizes frosting and rusting
- The Aerosol tight buckets and rotors prevent contamination and ensures safety
- Autoclavable and corrosion resistant rotors ensure safety and long life
- High-quality cabinets with scratch resistant powder coated finish

CONVENIENCE IN OPERATION

- Intuitive touch button with easy to follow controls
- Easy to read LCD display with bright white lettering on a blue LCD background
- Time control of pulse, timed, and continuous
- Automatic RPM/RCF conversion for prompt detection of g-force
- Easy to check actual rpm through the top window of door
- Program memory for up to 100 programs
- Automatic rotor identification function
- Automatic door-opening function when rotor is static, for easy retrieval of samples
- A large assortment of rotors, fixed angle or swing-out with buckets and adaptors

EASY CUSTOMIZATION

- Any rotors, sample containers, and adaptors can be manufactured according to customer's specification
- Flexibility of including any additional functions or programs in need

ECO-FRIENDLY MANUFACTURING

- Dust free AC induction motor
- Eco-safe refrigerant, R404a
- Very quiet operation at lesser than 56dB

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1. Meanings of Symbols & Safety Precautions

1-1. Meanings of Symbols

1-1-1. Symbols on the instrument

Symbol	Meaning	Symbol	Meaning
	Attention and warning.		Attention and warning for electric shock
	Attention and warning for rotor coupling.		Attention and warning for door opening and closing
	Attention and warning for correct way of sample balancing in the rotor.		Attention and warning for correct way of buckets position.
	Indicate a hole for manual door opening in case of emergency.		

1-1-2. Symbols in this document

Symbol	Meaning	Symbol	Meaning
	This symbol refers to safety relevant warnings and indicates possible dangerous outcomes.	☞	Note. This symbol refers to the important reminder.

1-2. Safety Precautions

Before using the instrument, please read this operation manual to ensure correct usage. Incorrect handling of the instrument could possibly result in personal injury or physical damage on the instrument or its accessories.

1. ALWAYS locate the instrument on a flat, rigid and stable floor capable of withstanding the weight of the instrument and its spinning operation.

2. ALWAYS make a safety zone of 30 cm around the centrifuge to indicate that neither hazardous materials nor persons should be permitted within the area during operation.

    - ✓ ALWAYS position the instrument with enough space on each side of instrument to ensure proper air circulation.

3. ALWAYS install the instrument within a temperature and humidity controlled environment. (Permissible ambient temperature: +5℃ ~ +35 ℃, Relative humidity: ≤ 85%)

4. Before connecting the power, check the rated voltage.

5. Should not use unapproved rotors and accessories.

    - ✓ Only use rotors from GYROZEN Co., Ltd. with appropriate centrifugal tubes and suitable adaptors to embrace sample containers tightly enough inside rotors.

6. Before operating the instrument, check if the rotor and the rotor lid are securely fastened.

    - ✓ Should operate the instrument with a rotor properly installed and secured to the motor shaft.

7. Mount the rotor on the motor shaft properly, check it with spinning manually.

8. Do not stop the rotor by touching with hand during the instrument is running.

9. Emergency door open should be performed only when spinning is completely stopped.

10. Should not exceed the rated speed or specific gravity. Samples whose density is greater than 1.2g/ml must have reduced maximum rotational speed to avoid rotor failure.

11. The sample content should not exceed 80% of total capacity of a tube. Otherwise, it would cause spillage of sample fluid and even the tube breakage.

12. ALWAYS load the tubes symmetrically with evenly weighted samples to avoid rotor imbalance. If necessary, use the water blank to counterbalance the unpaired sample.

13. The operation speed should not exceed the highest value of the individual guaranteed g-forces of each centrifuge, rotor, bucket or adaptors and sample container, especially the guaranteed g-force

of sample container should not be neglected.

14. The rotors should be cleaned and kept dry after every use for longer life and safety.

15. ALWAYS disconnect the power supply prior to maintenance care and service to avoid electrical shock.

16. ALWAYS use proven disinfection procedures after centrifuging biohazardous materials.

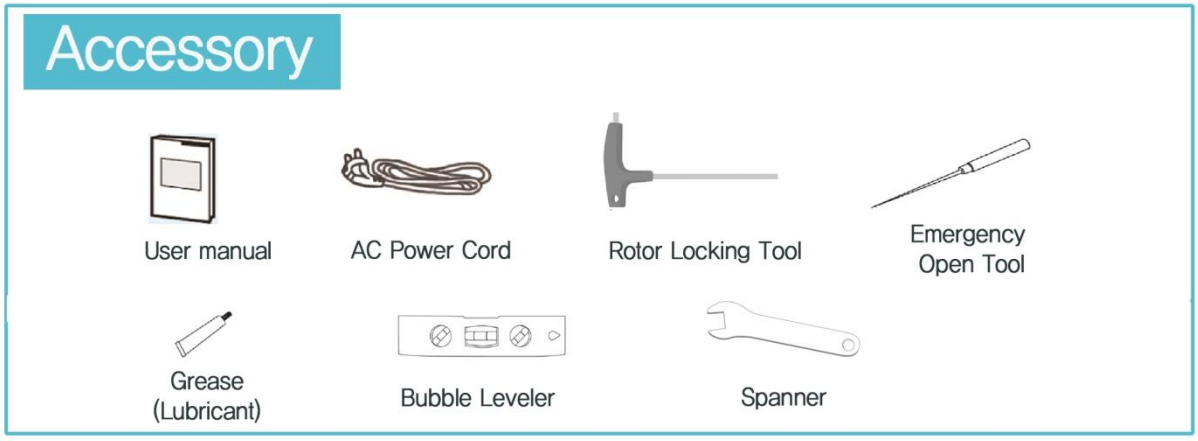
17. Should not centrifuge flammable, toxic, radioactive, explosive, or corrosive materials.

18. When it is necessary to use toxic or radioactive materials or pathogenic micro-organisms which belong to the Risk Group Ⅱ of WHO: "Laboratory Bio- safety Manual," should follow national regulations.

- ✓ Do not place dangerous materials within 30 cm distance around the instrument, and that is also recommended by IEC 61010-2-020.
- ✓ Use the emergency door open function only when the door button on the control panel is dumb under the condition of complete stop of rotor running.
- ✓ Never try to open or move the instrument if it is not completely stopped.

2. Product Description & Technical Specifications

2-1. Product Description



2-2. Technical Specifications

Max.RPM/RCF	Fixed angle	10,000 rpm / 14,981 xg
	Swing out	5,000 rpm / 6,222 xg
Max. capacity	Fixed angle	6 x 500 ml
	Swing out	4 x 1,400 ml
Temp. range(℃)		-10 ~ +40
FAST COOL button		Yes
Time control		Pulse, timed < 10 hr or continuous
RPM/RCF conversion		Yes
Noise level (dB)		≤56
Acc/Dec		9/10 steps
Program memory		100
Rotor Identification		Automation
Imbalance cutout		Yes
Display		Blue LCD
Safety lid lock		Yes
Lid drop protection		Yes
Power supply(V/Hz)		220/50~60 (110V optional)
Power requirement(KVA)		3.0
Dimension(W x D x H, mm)		643 x 762 x 850
Weight without rotor (Kg)		180
Cat. No.		GZ-1096R

☞ This instrument has following functions for safety.

1. Automatic rotor identification function.
2. Automatic detection and alarms for imbalance, excess speed and heating.
3. Automatic door lock function.

3. Preinstallation Requirements.

3-1. Environmental Requirement

1. Install the instrument on the flat and rigid floor. If you place the centrifuge on the slopping area, the motor shaft might be distorted by the rotor weight and centrifugal force.
2. Install the instrument about 30cm away from the wall for the air circulation. It is also recommended to install the instrument at the dustless place as much as possible.
3. Install the instrument at the place with appropriate temperature and humidity. It has to be maintained at the proper temperature & humidity. (Permissible ambient temperature: +5°C – +35 °C, Relative humidity: 30% ~ 85%)
4. Install the instrument at the place without any kinds of corrosive gases.

3-2. Electricity Requirement

1. Check the proper voltage of your instrument and connect to adequate power outlet.
2. If the power input is more than +/- 10% of the recommended voltage or fluctuates frequently, it may cause malfunction of the instrument and often result serious damage.

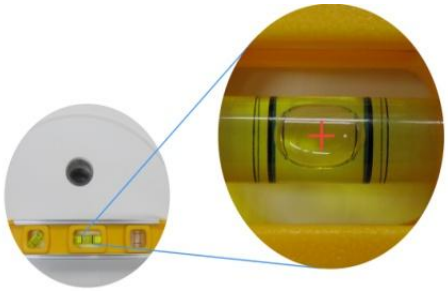
3-3. Unpacking

1. Untie the plastic banding over the paper box and get rid of box from the instrument main body.
2. Unwrap the vinyl coat surrounding the main body.
3. Place the instrument on a proper place by moving instrument's wheel.
4. Removal of Safety Padding

4. Installation

4-1. Balance Adjustment

Imbalancing of the instrument itself causes vibration, noise and error during operation. Check the level of the floor surface with a Bubble Leveler before installation.



Action

After locating the instrument on the solid and flat floor, check the horizontality with a Bubble Leveler.

1. Place the Bubble Leveler on top of the instrument.
   - Try to locate all bubbles in the center of the Bubble Leveler with rotating the red gear which is in caster of the instrument.

2. Adjust the height of four–wheel, which is at the bottom of the instrument, with rotating the red gear (which is in caster of the instrument) for the first balance adjustment. (For the final balance adjustment, please refer to 4-4. Balance Adjustment-Final)
   - For fixing a wheel: rotate the red gear counterclockwise with a spanner
   - For loosing a wheel: rotate the red gear clockwise with a spanner

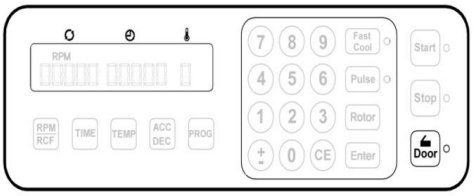
4-2. Power On/Off and Door Release

Action

4-2-1. Power On/Off

1. After connecting the AC Power cord at the power socket on the right back of the instrument, turn on the Earth leakage Breaker Switch.
   - Check the proper power.
2. Turn on the instrument by pressing a switch on the right side of the instrument.
   - With beeping sound, right before setting value is displayed.
   - The default values are Max. rpm, 10 min, ACC 4, DEC 4 and 25°C.

4-2-2. Door Release



1. For opening the door, touch the [DOOR] button.
   - Should touch the [DOOR] button when the door is closed (Door LED shows off)
   - Close the door until hearing clank shut.
   - When the door is opened, the door LED turns on.

☞
- ✓ The door is not opened while the instrument is running.
- ✓ If the door is opened, the instrument could not be operated even with pressing the 'Start' button.
- ✓ For operational safety, this instrument has the automatic rotor recognition function.
- ✓ When you supply the power, "Searching Rotor" /"Change to Rotor ID" will be appeared. If the rotor is absent, the "Error 9" will be appeared. This message will be cleared after rotor coupling and running.
- ✓ The door is not automatically opened after finishing operation to keep the sample at proper temperature.
- ✓ Power Failure: If there is any power failure during operation, door is not opened with 'Door' button. Door can be opened only when the operation is completely stopped and the power is on again. If you want to open the door at the power failure, please refer to '5-9. Emergency Door Open'.

4-3. Rotor Coupling and Disassembling

Action

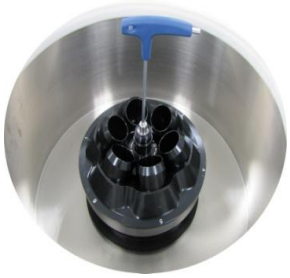
1. Before coupling a rotor, clean the motor shaft and rotor with soft dry towel.

4-3-1. Swing-Out Rotor

2. Mount a proper rotor into the motor shaft.
3. Grasp the rotor with one hand, and place Rotor Locking Tool at the center hole of the rotor.
   - ➢ To assemble the rotor: Rotate the Rotor Locking Tool clockwise until tightly assembled.
   - ➢ To disassemble the rotor: Rotate the Rotor Locking Tool counterclockwise.

4. Hang the appropriate buckets into the rotor.
   - ➢ Load the identical bucket at each wing for safety. (Do not leave a vacant wing without bucket. All wings should hold identical bucket.)
   - ➢ Remove dirt and water drop around hooks of rotor and hanging part of bucket.
5. Spin the rotor manually to check if bucket swinging is free enough and ever. If they do not swing freely, apply the Lubricant (grease) to the linking area.

4-3-2. Fixed Angle Rotor



2. Mount a proper rotor into the motor shaft.
   Grasp the rotor with one hand, and place Rotor Locking Tool at the center hole of the rotor.
   - ➢ To assemble the rotor: Rotate the Rotor Locking Tool clockwise until tightly assembled.
   - ➢ To disassemble the rotor: Rotate the Rotor Locking Tool counterclockwise

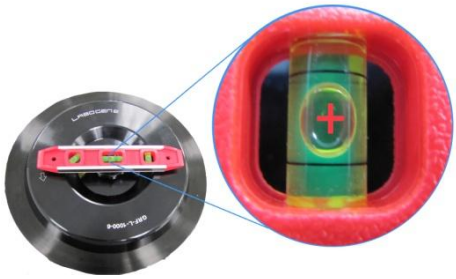
3. To close of the rotor lid, rotate the rotor lid nut clockwise.
   - ➢ For opening lid: rotate the rotor lid nut counterclockwise.

When you run a fixed angle rotor, make sure that the rotor lid is tightly closed. If you don't close the rotor lid completely, it will be crushed.

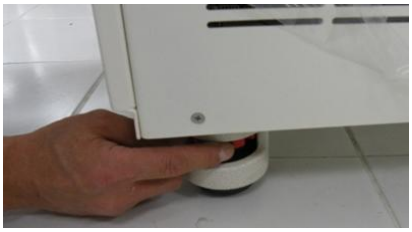
☞ For operational safety, this instrument has the automatic rotor recognition function.

When you supply the power, "Searching Rotor" /"Change to Rotor ID" will be appeared. If the rotor is absent, the "Error 9" will be appeared. This message will be disappeared after rotor coupling.

4-4. Balance Adjustment – Final



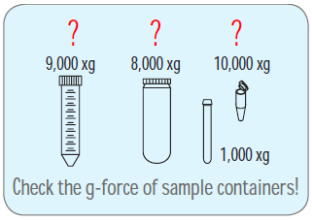
1. Mount the rotor and place the Bubble Leveler on the middle of the top of a rotor.
   - ➢ Confirm that air bubbles of all three windows of the Bubble Leveler are within the black lines.
2. To adjust the balance status, rotate the red colored ring at the wheel caster clockwise or counterclockwise until the device is well balanced.

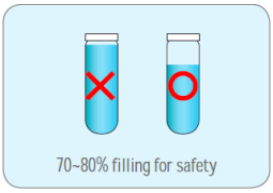


4-5. Positioning of Sample Tubes

1. Before loading sample tubes, check the water drop or dirt in the rotor hole or inner adaptor.
   - ➢ If there is a water drop or dirt in the rotor hole or inner adaptor, remove it with soft dry cloth.
2. Tubes should be placed in the rotor with same amount of samples at symmetrical positions.
   - ➢ Only use appropriate centrifugal tubes and do not exceed the speed beyond the tube's max. g-force.
   - ➢ For safety, fill the sample for 70~80% in the tubes.

Correct Ways of Sample Balancing & Tube Usage



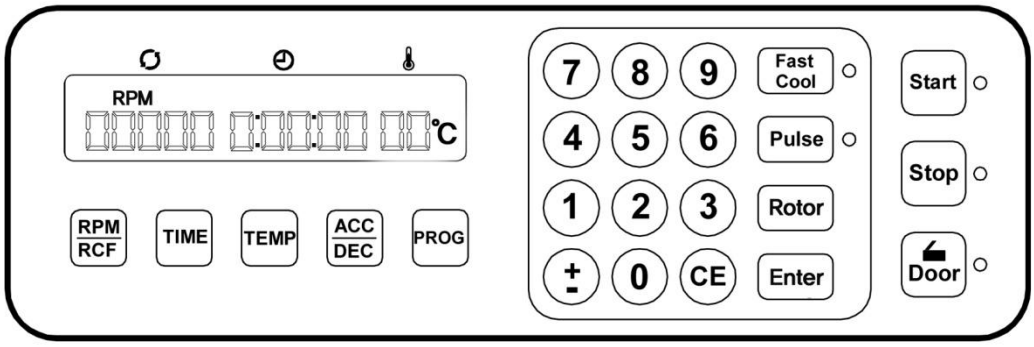


✓ If the number of samples is not in pair, please load the control tubes at each symmetrical position. Otherwise, it results noise and vibration, which eventually damage the instrument.

☞ For safety, the 'Imbalance Cut Off' function will be occurred, if there is imbalance of loading tubes (Error 8, Imbalance error). Please refer to 7. Trouble Shooting.

5. Operation

5-1. Key Functions of Control Panel



☐ RPM/RCF For automatic conversion of RPM/RCF and to set the speed

☐ TIME Use to set time, available range up to 9 hour 59 min 59 sec (0:00:00: continuous)

☐ Temp Use to set temperature

☐ ACC/DEC Use to set the acceleration & deceleration level from 1 to 5 steps. '0' step means natural deceleration. Larger number means faster acceleration or deceleration.

☐ PROG Use to save a set of setting values or recall the saved program number

☐ Fast Cool Use to reach rapid refrigeration up to the setting temperature.

☐ Pulse Use for quick runs

☐ Rotor g-value confirmation for using tube adaptors

☐ Enter Use for completion of data setting

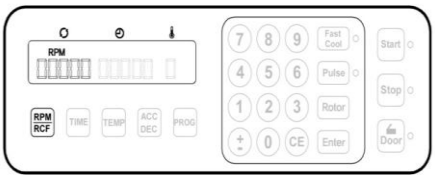
☐ Start/Stop Use to start or stop operation

☐ Door Use to open the instrument lid

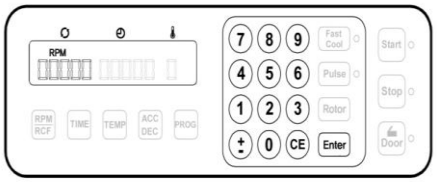
5-2. Setting the RPM/RCF Value

Action

5-2-1. Setting the RPM Value

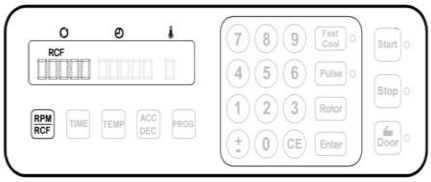


▶ Speed setting unit: 10 rpm

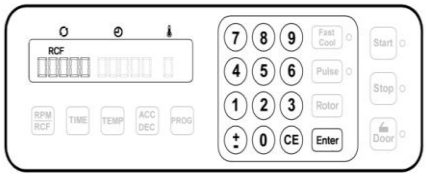


1. Touch a [RPM/RCF] button once.
2. Touch the number buttons to change input value. (*The minimum value of RPM is 500)
3. Touch the [Enter] button to complete the setting. If not touching the [Enter] button, the setting values are not saved.

5-2-2. Setting the RCF Value

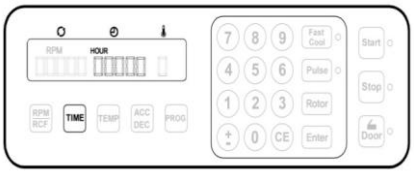


▶ Speed setting unit: 1 rcf



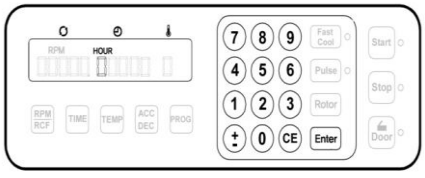
1. Touch a [RPM/RCF] button twice.
2. Touch the number buttons to change input value.
3. Touch the [Enter] button to complete the setting. If not touching the [Enter] button, the setting values are not saved..

5-3. Setting the Time Value

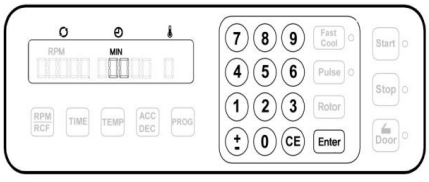


Action

▶ Time is down-counted after starting centrifugation.



1. Touch the [TIME] button. Display shows the maximum or latest time value and 'Hour' at the top of the hour value blinks.
2. Touch the number buttons to change the hour value.
3. Touch the [Enter] button to complete the setting, then 'MIN' (then 'SEC') at the top of the minute (then second) blinks automatically.
4. Touch the number buttons to change the value.
5. Touch the [Enter] button to complete the setting.

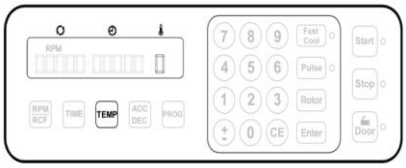


5-4. Setting the Temperature Value and Fast Cool

5-4-1. Setting the Temperature Value

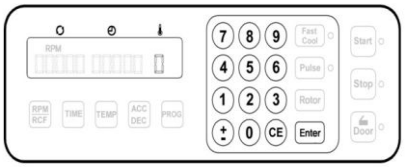
▶ Temperature can be set from -20℃ to 40℃

▶ Temp setting unit: 1 ℃



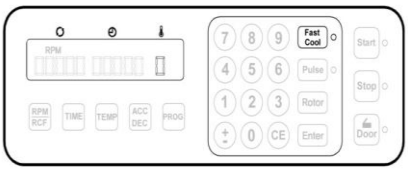
Action

1. Touch the [TEMP] button. Default or latest temperature value blinks in display.
2. Touch the number buttons to change temperature.
3. Touch the [Enter] button to complete setting.



☞ Set temperature is displayed when operation is stopped, and actual temperature is displayed during the operation.

5-4-2. Fast Cool



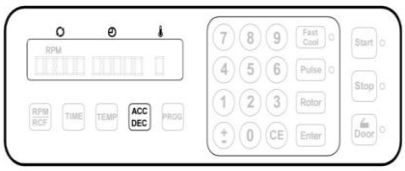
1. Setting the temperature. (Please refer to 5-4-1. Setting Temperature)
2. You can use [Fast Cool] to fast cooling.
   - ➢ 'Fast Cool' on LED is turned on.
   - ➢ The display shows a message as follows: "Searching Rotor" >> "recognition OK!"
   - ➢ By touching the [Fast Cool] button, the instrument is refrigerated down to the set temperature in a short time. During the fast cooling, the rotor runs at low speed (1,000 rpm)
   - ➢ The passed time is showed on display window.

☞
- ✓ If you'd like to load your sample tubes before touching the [Fast Cool] button, please check if the sample is safe during spinning at 1,000 rpm.
- ✓ Before starting Fast Cooling, please check the rotor coupling and symmetry of sample tube.

5-5. Acceleration / Deceleration

▶ Use the adjustment function of acceleration & deceleration levels to protect sensitive samples.

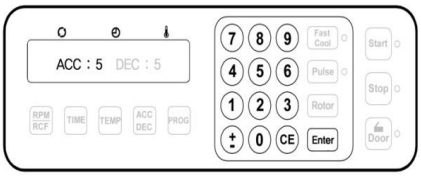
Action



1. Touch [ACC/DEC] button, then '#' at the display of 'ACC:#' blinks.
2. Input the desired level of ACC from 1 to 9. (Level 9: The fastest acceleration)
3. Fix the ACC level by touching [Enter] button. And then, '#' at the

display of 'DEC:#' blinks.

4. Input the desired level of DEC from 0 to 9. (Level 0: Natural deceleration / Level 9: The fastest deceleration)
5. Fix the DEC level by touching [Enter] button.

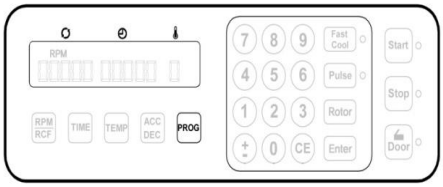


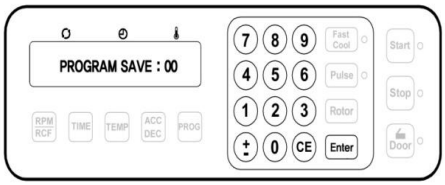
5-6. Program Saving & Recalling

Action

5-6-1.Program Saving

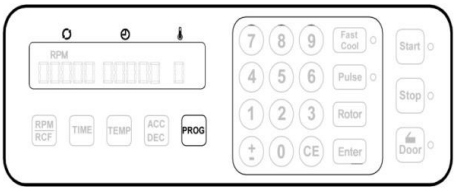
1. Set parameters. (Refer to 5-2~ 5.4)
2. Touch the [PROG] button longer than 3 seconds to save your preferred set values.
3. Check the message of "PROGRAM SAVE: ##" at the display, and input desired number to "##" blinks.
4. Touch the [Enter] button to complete the saving.

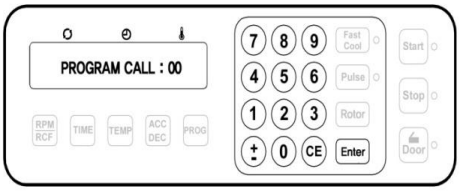




5-6-2. Program Recalling

1. To recall the saved program, just touch the [PROG] button shortly (less than 1 sec.).
2. Check the message of "PROGRAM CALL: ##", and enter the program number you want to recall. Then touch the [Enter] button.
   - ➢ Display window show the saved setting parameters (RPM/RCF, TIME, TEMP).



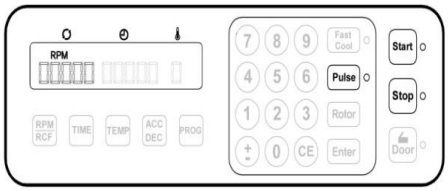


5-7. Pulse

▶ It is for quick and short spin down.

Action

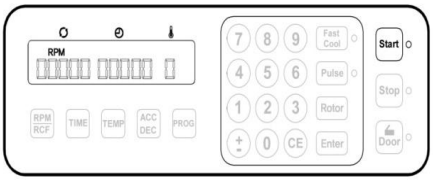
1. If you touch [Pulse] button and release at the point you want to stop, the centrifuge decelerates immediately.



5-8. Start/Stop

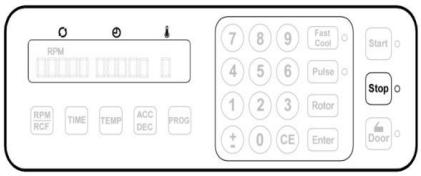
Action

5-8-1. Start



1. After setting RPM/RCF, Time and Temp., touch [Start] button.
   - ➢ During running, a 'Start LED' is turned on.

5-8-2. Stop



1. In case of touching the [Stop] button, the operation is stopped running.

5-9. Emergency Door Open

For emergency door opening, you can use the Emergency Door Open Tool as long when the instrument is completely stopped.

The door can be unlocked manually with Emergency Door Open Tool through the emergency opening hole.

1. Find the emergency hole in the front body of the instrument and take out the white rubber closure.
2. Insert the Emergency Door Open Tool into the hole and revolve it counter clockwise until the door is released.

> ⚠ Manual opening should be performed only when spinning is completely stopped. Otherwise, harmful damage will be accompanied to not only operators but samples.
> After opening the door manually, it is recommended to wait until normal electricity comes back.

6. Maintenance

6-1. Outer part of Instrument

1. Clean the outside of the instrument with dry soft cloth. If necessary, dip the cloth in neutral detergent and clean contaminated area. Keep completely dry after cleaning.
2. Do not use any volatile chemicals such as alcohol and benzene, etc.
3. Be careful not to make scratches on the surface of the instrument. The scratches can cause corrosion on the surface of the instrument.

✓ If any rust appears, clean it with neutral detergents and keep dry.

6-2. Chamber

1. Keep dry inside the chamber after every use.
2. If the chamber is contaminated, dip the cloth in neutral detergent and clean contaminated area.

6-3. Shaft

1. Always make special attention to clean the motor shaft to avoid any imbalance problem due to the contaminants.
2. After using the instrument, take out the rotor from the shaft, and clean the shaft with dry soft cloth to keep dry.

6-4. Rotor

1. If any parts are contaminated with samples, clean the rotor with soft wet cloth and keep the rotor dry.
2. Be careful not to make scratches inside or on the surface of rotors. Any small scratches can cause corrosion of the rotor and big damage to the instrument.
3. If you do not use the instrument, keep the rotor separately from the motor shaft and stand it upside down.

6-5. Transportation of Instrument

1. If you need to move or ship the instrument, be cautious to protect the motor shaft from any physical impact or turbulence.
2. Do not mount a rotor in any cases of movement. Fill inside the chamber with proper materials to keep the motor shaft on place and not to be influenced by physical pressure.

7. Trouble Shooting

7-1. Check List

Symptom	Check List
Power failure	Connect the AC Power cord and make sure that the line is completely connected between the instrument and power outlet. Check the power switch is turned on. (Please refer to 4-2. Power On/off and Door Release)
Can't be started	If the door is not closed completely, the instrument can't run. Check the Door LED on the display window and close the door completely.
Can't open the door	If the power is out, check the main fuse for the laboratory to supply the power. If it is not solved in shortly, open the door with emergency door tool manually for safety of sample. (Please refer to 5-9. Emergency Door Open)
Can't close the door	Remove the dirt at the door latch and then close the door completely again. If the door seems not being closed by mechanical reason, please contact our service team.
Noise and vibration during running	If the instrument is installed on the unstable floor, please install again on the solid flat floor horizontally.
	If the rotor is not coupled appropriately, disassemble the rotor and then check the appearance of rotor. If you find the damage of rotor, immediately discard it. (Please refer to 4-3. Rotor Coupling and Disassembling)
	Check balances of samples in the rotor. (Please refer to 4-5. Positioning of Sample Tubes) and load the same weight of samples symmetrically.

7-2. Error Code

If the instrument shows the error code with beeping sound, press 'STOP' button to stop the beeping sound and press 'Enter' button to release of the error status and make the instrument go to the default setting again.

Error	Possible Causes	Actions
Error 1	RPM Sensor	- Shut off the power supply, and then, turn on the power switch again to check the instrument. - If the error code shows continuously although you try to operate again, please call Gyrozen Field Service Engineer.
Error 2	Door	- If the door is not closed completely, this message is appeared. -Remove the dirt at the door latch and then close the door completely again. Check the Door LED on the display window. If it is not solved in shortly, open the door with emergency door tool manually for safety of sample. (Please refer to 5-9. Emergency Door Open)
Error 3	Motor Overheating	- If the motor is overheated, this message is appeared. -Shut off the power supply for an hour, and then turn on the power switch for checking the instrument. - If the error code shows continuously, please call Gyrozen Field Service Engineer.
Error 4	Low Voltage	- If the power input of Power supply (V/Hz) is 10% less than required power, this message is appeared. - Shut off the power supply and then check the voltage of the Power supply (V/Hz). - Use AVR to provide proper power.
Error5	High Voltage	- If the power input of Power supply (V/Hz) is 10% more than required power, this message is appeared. - Shut off the power supply and then check the voltage of the Power supply (V/Hz). - Use AVR to provide proper power.
Error 6	Over Speed	- If the instrument is spun with over speed, there will be some problems in the overload of motor and the output of motor. - Shut off the power supply, and then, turn on the power switch again to check the instrument.
Error 7	Software	- If the installed software has bugs, this message is appeared. - Tuning the firmware (Download)*

Error 8	Imbalance	- Check weight-balances of samples (Please refer to 4-5. Positioning of Sample Tubes) and then turn off and on the instrument for checking.
Error 9	Rotor ID or RPM Sensor	- If the function of rotor recognition is failed, this message is appeared. - This message will be cleared by coupling an appropriate rotor (Please refer to 4-4. Rotor Coupling and Disassembling.) - If the error code shows continuously, please call Gyrozen Field Service Engineer.
Error 11	Chamber Temp. Error	- If the instrument is not reached to setting temperature within an hour, this message is appeared. - No user action. Please call Gyrozen Field Service Engineer.
Error 12	Temp. Sensor Error	- If there is a faulty in the temperature sensing of chamber or over heated, this message is appeared. - No user action. Please call Gyrozen Field Service Engineer.
Error 15	Motor Temp. Sensor	- If the motor temperature sensor can't recognize, this message is appeared. - No user action. Please call Gyrozen Field Service Engineer.
Error 16	Comp. Temp. Sensor	- If the temperature of compressor is over heated up, this message is appeared. - No user action. Please call Gyrozen Field Service Engineer.

* Any wire disconnection or tuning of the instrument must be performed only by a service engineer who is authorized by GYROZEN Co., Ltd.

8. Rotors & Accessories

Swing Rotor, GRS-L-1400-4W

4 loadings
β- 90°
Included wind shield set

Tube					
Tube capacity(ml)	400	200	50 ml conical	50	15
Tube Rack					
Cat. No.	GRS-400-2(1400)	GRS-200-3(1400)	GRS-c50-9(1400)	GRS-50-12(1400)	GRS-15-24(1400)
Hole dimension (Φx L, mm)	104 x 58 x 135	104 x 35 x 135	29.5 x 100	29 x 93	17.2 x 100
Rack capacity(ea/R)	2/R	1/R	9/36	12/48	24/96
Radius(mm)	222.6	222.6	187.6	180.6	197.6
Max. RPM			3,500		
Max. RCF(g-force)	3,048	3,048	2,569	2,473	2,706

Oval Bucket
GLB-1400-1400
Bucket bore (width, mm) 134 x 135 x 135
Radius(mm) : 222.6
Max. RPM : 3,500
Max. RCF(g-force) : 3,048
Max height for tube fill(mm) : 150

Swing Rotor, GRS-L-mw-4W

4 loadings
β- 90°
Included wind shield set

Plate			
Plate capacity(ml)	MTP	DWP	Filter Plate
Holder capacity(ea/R)	4/16	1/4	1/4

Microplate Holder
GLP-mw-1096
Holder dimension (width, mm) 88 x 128.5 x 90
Radius(mm) : 214.7
Max. RPM : 5,000
Max. RCF(g-force) : 6,000

Swing Rotor, GRS-L-750-4

4 loadings
∧ 90°
Supplied with aerosol tight O-ring

Bioseal

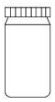
Bioseal Bucket

Round 750 mℓ Bucket GLB-b750-750 / GLB-750-750
Bucket bore(Φ xL, mm) : 99 x 101.5
Radius(mm) : 205
Max. RPM : 4,000
Max. RCF(g-force) : 3,667
Max height for tube fit(mm) : 130 (w/ cap) / 142 (w/o cap)

Tube								
Tube capacity(mℓ)	3	5	10	15	15 mℓ conical	50	50 mℓ conical	250
Tube rack								
Cat. No.	GAM-5-24(750)		GAM-10-21(750)	GAM-15-19(750)	GAM-c15-14(750)	GAM-50-7(750)	GAM-c50-5(750)	GAS-250(750)
Rack capacity(ea/4)	24/96		21/84	19/76	14/56	7/28	5/20	1/4
Hole dimension (Φx L, mm)	13 x 58	13 x 85	16 x 85	17 x 85	17 x 85	29 x 87	29 x 88	62.5 x 87

* GLB-b750-750 includes bioseal cap.

Round 500 mℓ Bucket GLB-500-750
Bucket bore(Φ xL, mm) : 69.2 x 135
Radius(mm) : 218
Max. RPM : 4,000
Max. RCF(g-force) : 3,900
Max height for tube fit(mm) : 167

Tube	
Tube capacity(mℓ)	500
Bucket capacity(ea/4)	1/4

Microplate Holder GLP-mw-750
Holder dimension (wxdxh, mm) : 88 x 128.5 x 80
Radius(mm) : 171.5
Max. RPM : 4,000
Max. RCF(g-force) : 3,068

Plate		
Plate capacity(mℓ)	MTP	DWP
Holder capacity(ea/4)	4/16	1/4

Swing Rotor, GRS-L-r750-4

4 loadings
∧ 90°

Rectangular 750 mℓ Bucket
GLB-r750-r750
Bucket bore (wxdxh, mm) : 99 x 99 x 98
Radius(mm) : 200
Max. RPM : 3,600
Max. RCF(g-force) : 2,898
Max height for tube fit(mm) : 135

Tube								
Tube capacity(mℓ)	3	5	10	15	15 mℓ conical	50	50 mℓ conical	250
Tube rack								
Cat. No.	GAM-5-30(r750)		GAM-15-20(r750)		GAM-c15-16(r750)	GAM-50-8(r750)	GAM-c50-5(r750)	GAS-250(r750)
Rack capacity(ea/4)	30/120		20/80		16/64	8/32	5/20	1/4
Hole dimension (ΦxL, mm)	13 x 56.5	13 x 85	17.2 x 85		17.5 x 85	29.5 x 85	29.5 x 85	62.5 x 87

Round 500 mℓ Bucket
GLB-500-r750
Bucket bore(ΦxL, mm) : 69.2 x 135
Radius(mm) : 218
Max. RPM : 3,600
Max. RCF(g-force) : 3,159
Max height for tube fit(mm) : 167

Tube	
Tube capacity(mℓ)	500
Bucket capacity(ea/4)	1/4

Microplate Holder
GLP-mw-r750
Holder dimension (wxdxh, mm) : 88 x 128.5 x 80
Radius(mm) : 171.5
Max. RPM : 3,600
Max. RCF(g-force) : 2,485

Plate		
Plate capacity(mℓ)	MTP	DWP
Holder capacity(ea/4)	4/16	1/4

Swing Rotor, GRS-L-r250-4

4 loadings
90°

Rectangular 250 mℓ Bucket
GLB-r250-r250
Bucket bore (wxdxh, mm) : 86 x 70.3 x 98.5
Radius(mm): 175.2
Max. RPM : 4,000
Max. RCF(g-force) : 3,134
Max height for tube fit(mm) : 125

Tube										
Tube capacity(mℓ)	3	5	10	15	15 mℓ conical	50	50 mℓ conical	15	85	250
Tube rack										
Cat. No.	GAM-5-12(r250)		GAM-15-12(r250)		GAM-c15-9 (r250)	GAM-50-4 (r250)	GAM-c50-3 (r250)	GAM-85-2(r250)		GA5-250(r250)
Rack capacity(ea/4)	12/48	12/48	12/48		9/36	4/16	3/12	2/8		1/4
Hole dimension (ΦxL, mm)	13.5 x 58	13.5 x 80	17.5 x 90		17.5 x 90	30.2 x 90	30.5 x 90	17 x 90	38.5 x 90	62.5 x 87

Microplate Holder
GLP-mw-r250
Holder dimension (wxdxh, mm) : 88 x 128.5 x 80
Radius(mm) : 175.2
Max. RPM : 4,000
Max. RCF(g-force) : 2,737

Plate		
Plate capacity(mℓ)	MTP	DWP
Holder capacity(ea/4)	4/16	1/4

100 mℓ Bucket
GLB-100(L)-r250
Bucket bore (ΦxL, mm) : 35.5 x 180.6
Radius(mm) : 243.6
Max. RPM : 4,000
Max. RCF(g-force) : 4,358
Max height for tube fit(mm) : 207

Glass	
Glass capacity(mℓ)	100

100 mℓ Bucket
GLB-100(S)-r250
Bucket bore (ΦxL, mm) : 44.6 x 143.3
Radius(mm) : 232.3
Max. RPM : 4,000
Max. RCF(g-force) : 4,155
Max height for tube fit(mm) : 193

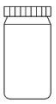
Glass	
Glass capacity(mℓ)	100

100 mℓ Bucket
GLB-100(C)-r250
Bucket bore (ΦxL, mm) : 13.3 x 145.3
Radius(mm) : 234.3
Max. RPM : 4,000
Max. RCF(g-force) : 4,191
Max height for tube fit(mm) : 188

Glass	
Glass capacity(mℓ)	100

Fixed Angle Rotor, GRF-L-500-6

6 x 500 mℓ
∧ 25°
Hole diameter (mm) : 70
Max height for tube fit (mm) : 167

Tube	
Tube capacity(mℓ)	500
Radius(mm)	170
Max. RPM	8,000
Max. RCF(g-force)	11,305

Fixed Angle Rotor, GRF-L-250-6

6 x (250 & 15 mℓ)
∧ 25°
Hole diameter (250/15)(mm) : 62/17
Max height for tube fit (250/15)(mm) : 125/110

Tube		
Tube capacity(mℓ)	15	250
Radius(mm)	134	
Max. RPM	10,000	
Max. RCF(g-force)	14,679	14,981

9. Product Range